

## § 23.399

<sup>2</sup>If the design of any individual set of control systems or surfaces makes these specified minimum forces or torques inapplicable, values corresponding to the present hinge moments obtained under § 23.415, but not less than 0.6 of the specified minimum forces or torques, may be used.

<sup>3</sup>The critical parts of the aileron control system must also be designed for a single tangential force with a limit value of 1.25 times the couple force determined from the above criteria.

<sup>4</sup>D=wheel diameter (inches).

<sup>5</sup>The unsymmetrical force must be applied at one of the normal handgrip points on the control wheel.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-7, 34 FR 13089, Aug. 13, 1969; Amdt. 23-17, 41 FR 55464, Dec. 20, 1976; Amdt. 23-34, 52 FR 1829, Jan. 15, 1987; Amdt. 23-45, 58 FR 42160, Aug. 6, 1993]

### § 23.399 Dual control system.

(a) Each dual control system must be designed to withstand the force of the pilots operating in opposition, using individual pilot forces not less than the greater of—

(1) 0.75 times those obtained under § 23.395; or

(2) The minimum forces specified in § 23.397(b).

(b) Each dual control system must be designed to withstand the force of the pilots applied together, in the same direction, using individual pilot forces not less than 0.75 times those obtained under § 23.395.

[Doc. No. 27805, 61 FR 5145, Feb. 9, 1996]

### § 23.405 Secondary control system.

Secondary controls, such as wheel brakes, spoilers, and tab controls, must be designed for the maximum forces that a pilot is likely to apply to those controls.

### § 23.407 Trim tab effects.

The effects of trim tabs on the control surface design conditions must be accounted for only where the surface loads are limited by maximum pilot effort. In these cases, the tabs are considered to be deflected in the direction that would assist the pilot. These deflections must correspond to the maximum degree of "out of trim" expected at the speed for the condition under consideration.

### § 23.409 Tabs.

Control surface tabs must be designed for the most severe combination of airspeed and tab deflection likely to be obtained within the flight envelope for any usable loading condition.

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### § 23.415 Ground gust conditions.

(a) The control system must be investigated as follows for control surface loads due to ground gusts and taxiing downwind:

(1) If an investigation of the control system for ground gust loads is not required by paragraph (a)(2) of this section, but the applicant elects to design a part of the control system of these loads, these loads need only be carried from control surface horns through the nearest stops or gust locks and their supporting structures.

(2) If pilot forces less than the minimums specified in § 23.397(b) are used for design, the effects of surface loads due to ground gusts and taxiing downwind must be investigated for the entire control system according to the formula:

$$H = K c S q$$

where—

H=limit hinge moment (ft.-lbs.);

c=mean chord of the control surface aft of the hinge line (ft.);

S=area of control surface aft of the hinge line (sq. ft.);

q=dynamic pressure (p.s.f.) based on a design speed not less than  $14.6 \sqrt{(W/S) + 14.6}$  (f.p.s.) where W/S=wing loading at design maximum weight, except that the design speed need not exceed 88 (f.p.s.);

K=limit hinge moment factor for ground gusts derived in paragraph (b) of this section. (For ailerons and elevators, a positive value of K indicates a moment tending to depress the surface and a negative value of K indicates a moment tending to raise the surface).

(b) The limit hinge moment factor *K* for ground gusts must be derived as follows:

Surface	<i>K</i>	Position of controls
(a) Aileron .....	0.75	Control column locked lashed in mid-position.
(b) Aileron .....	±0.50	Ailerons at full throw; + moment on one aileron, – moment on the other.
(c) Elevator .....	±0.75	(c) Elevator full up (–).
(d) Elevator .....	.....	(d) Elevator full down (+).
(e) Rudder .....	±0.75	(e) Rudder in neutral.
(f) Rudder .....	.....	(f) Rudder at full throw.

(c) At all weights between the empty weight and the maximum weight declared for tie-down stated in the appropriate manual, any declared tie-down points and surrounding structure, control system, surfaces and associated